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FIREBERD 2000-1
OPERATIONS MANUAL
PRELIMINARY

TTC · July, 1981

Telecommunications
Techniques
Corporation

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OPERATIONS MANUAL
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SECTION 1
GENERAL INFORMATION

1.1 INTRODUCTION

This Operating Manual contains information required to install and operate the FIREBERD 2000-1 Data Error Analyzer. This section contains general information relating to the FIREBERD 2000-1. This information includes instrument identification, specifications, instrument description, equipment supplied, options, accessories and ordering information. Other sections contain information on preparation for use, instrument checkout, instrument description, operation, printer interfaces, data interface modules, options, accessories and service.

1.2 INSTRUMENT IDENTIFICATION

An identification sticker is attached to the rear panel of each instrument. The serial number on this plate should be quoted on any correspondence with TTC.

1.3 SPECIFICATIONS

- Test Patterns: Pseudorandom sequences of length 63, 511, 2047, $2^{15}-1$, and $2^{20}-1$. Constant mark, constant space and 1:3 (1 space followed by 3 marks ...)
- Operating Rate
  - Error Analysis: 50 Hz to 10 MHz
  - Frequency Measurement: 200 Hz to 15 MHz
- Internal Standard
  - Clock Frequencies: 2.4, 4.8, 9.6, 19.2, 56, 112, 224, and 448 kHz
  - Accuracy: $\pm$1 ppm at 25°C
  - Stability: $\overline{1}$ ppm 0 to 40°C
  - Drift: <1.5 ppm per year
- Internal Optional Clock
  - Frequencies: 50 Hz to 10 MHz
  - Accuracy: $\pm$1 ppm at 25°C
  - Stability: $\overline{5}$ ppm 0 to 40°C
  - Drift: 5 ppm per year typical
- Frequency Counter
  - Accuracy: $\pm$1 ppm $\pm$ count over one Second

- External Clock Input (BNC)
  - Frequency: 50 Hz to 15 MHz
  - Waveform: Sine or square wave unipolar or bipolar
  - Level: .6v pp to 25v pp
- Measurements: BER, Errors, Blocks, Block Errors, Error-Seconds, Seconds of Test, Frequency, Average BER
- Real Time Clock Outputs: Month, Day, Hour, Minutes and Seconds
- Block Lengths: 400, 1k, 4k, 10k, 40k, 100k
- BER Test Length
  - Fixed Length: 10^6, 10^7, 10^8, 10^9, 10^{10}
  - Automatic: 10^5, 10^6, 10^7, 10^8, 10^9, 10^{10}, 10^{11}
- BER Range: 1 to 10^{-11} errors/bit
- Error Insertion: Single error or constant 10^{-3} error rate
- Events Initiating Printout: Manual, Error, 1 min., 10 min., 30 min., BER Cycle, Sync Loss, Signalling Change, Counter Overflow, Sync Acquisition and Power On
- Emulation Capability: DTE or DCE
- Available Interfaces:
  - RS-232 Sync DTE
  - RS-232 Sync/Isoch DTE
  - RS-232 Sync/Async (Character) DTE/DCE
  - RS-232 Sync DTE/DCE
  - V.35/306 DTE
  - V.35/306 DTE/DCE
  - 449-422/423 DTE
  - 449-422/423 DTE/DCE
  - 449-422/423 Bridging
  - DS1 (T1)
  - WECO 303
  - LAB (TTL)
  - Mil 188-114 Bipolar Unbalanced
- Display Size: 7 Digits
- LED Indicators: Sync, Sync Lost, Generator Clock Activity, RCV/TX Clock Activity, RCV/TX Data Activity, Data Invert,

• LED Indicators: (cont'd.):	Power, DM(DSR)/TR(DTR), RR(RLSD)/ RS(RTS), CS(CTS)/LL, TM/RL, Less Than 100 Errors, DTE, DCE
• Input/Output Signals via Interface Modules:	TX Clock (DCE Source) TX Clock (DTE Source) TX Data, RCV Data, RCV Clock, RS(RTS), CS(CTS), TR(DTR), RR(RLSD), DM(DSR), TR, RL, LL
• Signals at Rear Panel Test Points (TTL Levels):	TX Sync, RCV Sync, Error, Ground, RCV Clk, TX Clk (DTE Source), TX Clk (DCE Source), TX Data, RCV Data
• Size:	6" x 12" x 12"
• Weight (approx.) with Interface Module:	10 lbs.
• Power:	Switch selectable 100/120/220/240 VAC +10% 48 to 66Hz 60 Volt-Amperes (maximum)
• Enviromental:	0 to 50°C operating -40 to 85°C storage

1.4 DESCRIPTION

The FIREBERD 2000-1 is designed to aid in troubleshooting and evaluating digital communications systems. With the appropriate Interface Module, the 2000-1 may be used to test communication systems configured as either Data Terminal Equipment (DTE) or Data Communications Equipment (DCE). The unit has fully independent transmitter and receivers to allow loop-around or end to end testing.

The FIREBERD 2000 simultaneously measures bit error rate, (BER) bit errors, block errors, blocks, error seconds and total seconds of test at any data rate between 50 bps and 10 Mbps. The test set is also capable of measuring transmit frequency, receive frequency, or the frequency of a signal input through its rear panel BNC input. A seven digit display and a variety of front panel indicators provide measurement results and the status of the system under test. Rear panel test points allow data from the system under test to be further analyzed with an oscilloscope. Additional

measurement features include: a real time clock which keeps time even when the unit is unplugged from the AC power source, automatic polarity detection, automatic synchronization and the ability to count through error bursts.

Extensive print out capability is provided. All available results may be printed out along with the time, date, instrument ID number, and a label for each result. Data prints may be initiated manually or automatically. The front panel print controls allow automatic printing on time intervals, errors, or BER measurement cycles. Print outs are also provided on : power up, sync acquisition, sync loss, test restart and various other important measurement events. A control print function allows all important switch positions to be printed out at the beginning of a test. This combination of printing functions allows the test conditions, sequence of events and results to be totally documented by the printer.

A RS-232 printer interface is provided as standard equipment. This interface may be used to provide data to: the TTC model PR-1500 or PR-2000 printers, printers made by other manufacturers, or the TTC model DL 2000 magnetic data logger. An IEEE 488 printer interface is also available. This interface can be used to output directly to a 488-compatible printer. Alternatively, this interface allows the FIREBERD to act as an "addressable talker" in a 488 bus configuration.

Data and clock signals interface with the FIREBERD via rugged plug-in modules which insert through the rear panel. Each module meets a different standard interface specification and includes the standard connector. Thirteen different Modules are available.

Full self-test capability is provided. This feature allows the entire FIREBERD and interface module in use to be tested without any additional test equipment.

1.5 EQUIPMENT SUPPLIED

The following equipment is supplied with each FIREBERD 2000-I:

Power Cord
Operating Manual

1.6 OPTIONS

The following options extend the usefulness of the 2000.

Option No.	Descriptions
001	IEEE-488 Interface (Addressable Talker Only)
003	One Optional Clock Rate with 1 ppm Accuracy*
004	Two Optional Clock Rates with 1 ppm Accuracy*
005	Three Optional Clock Rates with 1 ppm Accuracy*

* customer specified Frequencies

1.7 ACCESSORIES AVAILABLE

The following accessories are available.

Description	Model Number
Thermal Printer with serial RS-232 interface (includes cable)	PR-2000
Rack Mount for FIREBERD and Printer	RM-1500
Thermal Printer Paper (12 rolls)	10217-01
Extra Manual	ML10220
Carrying Case	10170-01
Shipping Case	10176-01
Magnetic Data Logger (Cassette)	DL-2000
Data Logger Cassettes	10222-01
RS-232 Sync DTE Interface	40112-01
RS-232 Sync/Isoch DTE Interface	40232-01
RS-232 Async (Character) DTE/DCE Interface	40234-01
RS-232 Sync DTE/DCE Interface	40236-01
V.35/306 DTE Interface	40138-01
V.35/306 DTE/DCE Interface	40202-01
RS-449-422/423 DTE Interface	40180-01
RS-449-422/423 DTE/DCE Interface	40200-01
RS-449-422/423 Bridging Interface	40198-01
DS1 (T1) Interface	40151-01
MIL 188-114 Unbalanced Bipolar Interface	40226-01

WECO 303 DTE Interface	40182-01
LAB Interface (TTL, 50, 75, 100 Ω) Unipolar/Bipolar Balanced /Unbalanced	40227-01

RS-232 6' cable (male to male)	10213-01
V.35 6' cable (male to male)	10214-01
RS-449 6' cable (male to male)	10215-01
DS1 cable (15 pin connector)	10199-01

1.8 ORDERING INFORMATION

Equipment may be ordered by contacting:

Woody Story
Marketing Manager
Telecommunications Techniques Corporation
7 Dalamar Street
Gaithersburg, Maryland 20877

SECTION 2
PREPARATION FOR USE

2.1 INTRODUCTION

This section provides unpacking and initial inspection instructions, warnings, and power requirements.

2.2 UNPACKING AND INITIAL INSPECTION

Inspect the shipping container for damage. If the shipping container or shipping material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. Procedures for checking electrical performance are given in Section 3 . If the contents are incomplete, if there is mechanical damage or defect, or if the FIREBERD does not pass the performance tests, notify TTC. If the shipping container is damaged, notify the carrier as well as TTC. Keep the shipping materials for the carrier's inspection.

2.3 WARNINGS

The following precautions must be observed before and during all phases of operation of the instrument. Failure to comply with these precautions or specific warnings elsewhere in the manual may cause physical harm to the operator or to the instrument. TTC assumes no liability for the customer's failure to comply with these requirements.

GROUND THE INSTRUMENT

To minimize shock hazard, the instrument chassis must be connected to an electrical ground. The instrument is equipped with a three-conductor AC power cable. The power cable must either be plugged into an approved three-contact electrical outlet or used with a three-contact to two-contact adaptor with grounding wire (green) firmly connected to an electrical ground (safety ground) at the power outlet.

USE PROPER LINE VOLTAGE SETTING AND FUSE SIZE

Before connecting the AC power cord, verify that the line voltage selector card is positioned for the correct operating voltage. Never operate

the instrument with the incorrect fuse size. See Section 2.4 for detailed information on setting the line voltage selection card and proper fuse size.

KEEP AWAY FROM LIVE CIRCUITS

Do not remove instrument covers or insert fingers or other objects through rear panel holes while power is applied to the instrument.

DO NOT SERVICE THE INSTRUMENT

Component replacement and internal adjustments must be made only by qualified maintenance personnel authorized by TTC.

TURN OFF POWER BEFORE INSERTING AND REMOVING INTERFACE MODULES.

DO NOT OPERATE IN AN AMBIENT TEMPERATURE ABOVE 50° C.

2.4 POWER REQUIREMENTS

The instrument requires a power source of 100, 120, 220, or 240 volts AC ± 10%, single phase, 48 to 66 Hz that can deliver 60 volt-amperes (maximum). The instrument is normally shipped from the factory set to operate from a 120 volt power source. To operate the instrument from a different source voltage, proceed as follows:

a. Remove the input power cord.
b. Slide the plastic door to the left.
c. Remove the fuse.
d. Pull the voltage select card straight out.
e. Change the orientation of the voltage select card and reinsert so the appropriate operating voltage is visible on the card after it has been installed.
f. Install the appropriate size fuse (See Table 2-1).
g. Slide the plastic door to the right and reinsert power cord.

TABLE 2-1

FUSE SIZE

Operating Voltage	Fuse Size	Fuse Type
100	½ amp 250V	3AG
120	½ amp 250V	3AG
220	¼ amp 250V	3AG
240	¼ amp 250V	3AG

SECTION 3
INSTRUMENT CHECKOUT

3.1 INTRODUCTION

This procedure is designed to offer a quick method of determining the operating status of the FIREBERD. Each section will ask the operator to perform a specific action (A) on the FIREBERD. Each action is followed by an observation (O). If the designated observation is not made, an operator servicable diagnostic (D) is available. To increase the throughness of this procedure each section may be tested in every possible combination of test parameters.

All tests are performed in LOOP TEST Mode. The FIREBERD operation in this mode is directly related to the interface module. If a failure occurs insert another interface and repeat entire test.

If the interface module has clock invert switches they must be placed in the NORMAL position. Other interface module switches should be set appropriately. Refer to Section 7 if necessary. If servicing is required, it is helpful to note the section of the self test procedure where your FIREBERD failed.

3.2 PREPARATION

1) Any of the FIREBERD Data Interface Modules may be used for this self test procedure. Be sure to install the interface module with the AC power off.

2) Verify that the AC line voltage card is set appropriately for the existing line voltage (see Section 2.4). Then, turn the power (PWR) ON.

3) The LOOP TEST switch must be in the LOOP position throughout entire test unless otherwise specified.

4) Set the MODE switch to ERROR ANLYSIS.

3.3 SELF TEST PROCEDURE

1) GENERATOR CLOCK

A (Action): Set the GENERATOR CLOCK switch to the desired frequency.

O (Observation): The GENERATOR CLOCK and RCV CLOCK/TX CLOCK ACTIVITY detectors are now on.

D (Diagnostic): The GENERATOR CLOCK must be set at an available clock frequency. If the GENERATOR CLOCK switch is set in the EXT position, the clock signal used for the test must be input through the interface module unless a signal is provided at the BNC (EXT CLK IN) on the rear panel of the FIREBERD.

2) DATA

A: Set the GENERATOR CLOCK switch to 19.2, the PATTERN switch to 2^{20}-1 and the ERROR INSERT to OFF.

O: The RCV DATA/TX DATA activity detector is on and the data invert (RCV DATA INV/TX DATA INV) LED is off.

A: Set the PATTERN switch to the Mark (MK) or Space (SP) position.

O: Verify that the RCV DATA/TX DATA activity detector is off.

D: 1. There must be generator clock activity to develop transmit clock and data.

2. FIREBERD must be in the LOOP Test and the Interface Adaptor must be installed and set appropriately.

3) SYNCHRONIZATION and ERROR COUNT

A: Initial conditions. Set:

1. GENERATOR CLOCK switch to 19.2
2. PATTERN to 2^{20}-1
3. ERROR INSERT to OFF
4. BLK LENGTH to 400
5. BER TEST LENGTH to AUTO
6. MODE to ERROR ANALYSIS
7. AUTO SYNC to ENABLE
8. Display control to UPDATE
9. LOOP TEST to LOOP
10. Momentarily depress RESTART

O. The FIREBERD is now synchronized with the incoming data. The SYNC and <100 ERRORS LEDS are on and the SYNC LOST and RCV DATA INV LEDS are off.

A: Select each DISPLAY position and verify the results.

O: 1. BER - Zero BER

2. ERR - Zero

3. SEC - Counting

4. ERR SEC - Zero

5. BLKS - Counting

6. BLK ERR - Zero

A: Depress ERROR INSERT 10 times.

O: Verify 10 errors, 10 block errors and several errored seconds.

A: Set ERROR INSERT to 10^{-3}, the DISPLAY switch to BER, and depress RESTART.

O: Within 5 seconds of the RESTART the BER display will read 1.00E-3, and the Audio Indicator will beep twice.

A: Set the BER switch to 10^{6} and depress RESTART.

O: Within 52 seconds of the Test Restart the BER display will be 1.00E-3, and the Audio Indicator will beep twice.

D: 1. At other operating frequencies or test lengths the results may take longer to appear. The BER mode update rate is dependent on the clock rate and the BER test length.

$$\text{BER update time in seconds} = \frac{\text{test length (bits)}}{\text{clock frequency (bits/secs)}}$$

2. There must be a receive clock and data signal for synchronization to occur.

3. Be sure the generator clock is active and that you are not exceeding the maximum data rate inherent to your particular interface module:

V.35 - 10 MHz	Lab - 10 MHz
RS-232 - 20 kHz	WECO 303 - 500 kHz
449 - 423 - 1 MHz	DS1 - 1.544 MHz $\pm$ 100 Hz
449 - 422 - 10 MHz	

4) FREQUENCY

A: Set the MODE switch to TX FREQ and place the LOOP TEST switch in the LOOP position.

O: Verify that the display shows the correct frequency for each position of the GENERATOR CLOCK switch.

A: Set the MODE switch to RCV FREQ.

O: Verify that the display shows the correct frequency for each position of the GENERATOR CLOCK switch.

D: 1. The DISPLAY switch must be in one of the 5 left-most positions to display the frequency results.

2. The RCV CLOCK/TX CLOCK and Generator Clock activity detectors must be on.

3. Check the Interface Adaptor for proper installation.

4. When using the FIREBERD as a DTE the transmit clock signal is selected by the GENERATOR CLOCK switch and the receive clock signal is that signal at the input to the error analysis circuitry. For DCE operation the receive clock signal is selected by the GENERATOR CLOCK switch and the transmit clock source is the signal input to the FIREBERD error analysis circuitry.

5) TIME SET

A: Place DISPLAY switch in the BER position.

A: Depress and hold the PRINT CONTROLS toggle switch in the RESULTS position.

O: Within 3 seconds FIREBERD will enter Time Set Mode and the Display will flash the Hours position.

A: With the CLK SET switch, increment the Hours position 24 hours and release the RESULTS switch.

O: Verify the time or date has not changed and that the seconds did not reset to Zero.

D: 1. Time/Date and Time Set Modes are dependent only on the instrument power supply. Be sure the PWR LED is on.

2. Time and Date are only updated if any one of the parameters have been changed before releasing the RESULTS switch.

3. The seconds can only be set to zero. If they are not set, the count continues throughout the Time Set procedure.

6) PRINTER

A: Connect the cable provided between the PR2000 printer and the RS-232C PRINTER connector on the rear panel of the FIREBERD.

A: Initial conditions. Set.

1. GENERATOR CLOCK to 19.2
2. ERROR INSERT to 10^{-3}
3. BLK LENGTH to 400
4. BER TEST LENGTH to 10^{6}
5. MODE to ERROR ANALYSIS
6. PRINT CONTROL (EVENT) to BER CYCLE
7. RESTART

O: Within 52 seconds of the Test Restart a data print out including all error analysis test results.

A: Set the EVENT and ERROR INSERT switches to the OFF position.

O: Verify the data print outs stop after the present print out.

A: Set the EVENT switch to ERR and insert a single error, then depress the RESULTS switch.

O: Verify the printing of two Data Results

A: Toggle the PRINT CONTROL to the CONTROLS position.

O: Verify the printing of all FIREBERD switch positions except CLK SET, PWR, RESULT HOLD/UPDATE/RESTART, CONTROLS/AUTO/RESULTS, DISPLAY and the AUDIO INDICATOR switch positions. Does not print Interface switches except for RS-449 DTE/DCE, V.35/306 DTE/DCE, RS-449 BRIDGING INTERFACE switches.

D: 1. All printer functions are disabled in the OFF position except for manually activated prints.

2. The Printer must be plugged in and turned on before the FIREBERD is turned on if the IEEE-488 option is provided.

3. Verify the printer paper is not empty and that the interconnecting cable is secure.

SECTION 4
INSTRUMENT DESCRIPTION

4.1 INTRODUCTION

This section provides a detailed description of each control, indicator, connector and test point on the FIREBERD. This is followed by a functional description for each of the major elements which make up the instrument.

4.2 CONTROLS, INDICATORS, CONNECTORS and TEST POINTS

Figures 4-1 and 4-2 are photographs of the front and rear panels, respectively. The numbers on these figures correspond to the numbered descriptions which follow.

It is important to note that the movement of some switches on the FIREBERD will restart a test and others may be changed without affecting the ongoing test, i.e.

Switches that cause a test restart:

a) GENERATOR CLOCK
b) PATTERN
c) MODE
d) LOOP TEST
e) RESTART
f) BLK LENGTH
g) BER TEST LENGTH
h) PWR
i) Interface Module switches on some interfaces

Switches which will not cause a test restart:

a) ERROR INSERT
b) DISPLAY
c) AUTO SYNC [1]
d) RESULT HOLD/UPDATE
e) Time Set Mode
f) RS(RTS)/RR(RLSD)
g) TR(DTR)/DM(DSR)
h) AUDIO INDICATOR
i) PRINT CONTROL

[1] If an error rate of 10^{-1} or greater occured in the AUTO SYNC DISABLE MODE, switching to AUTO SYNC ENABLE Mode will cause a test restart.

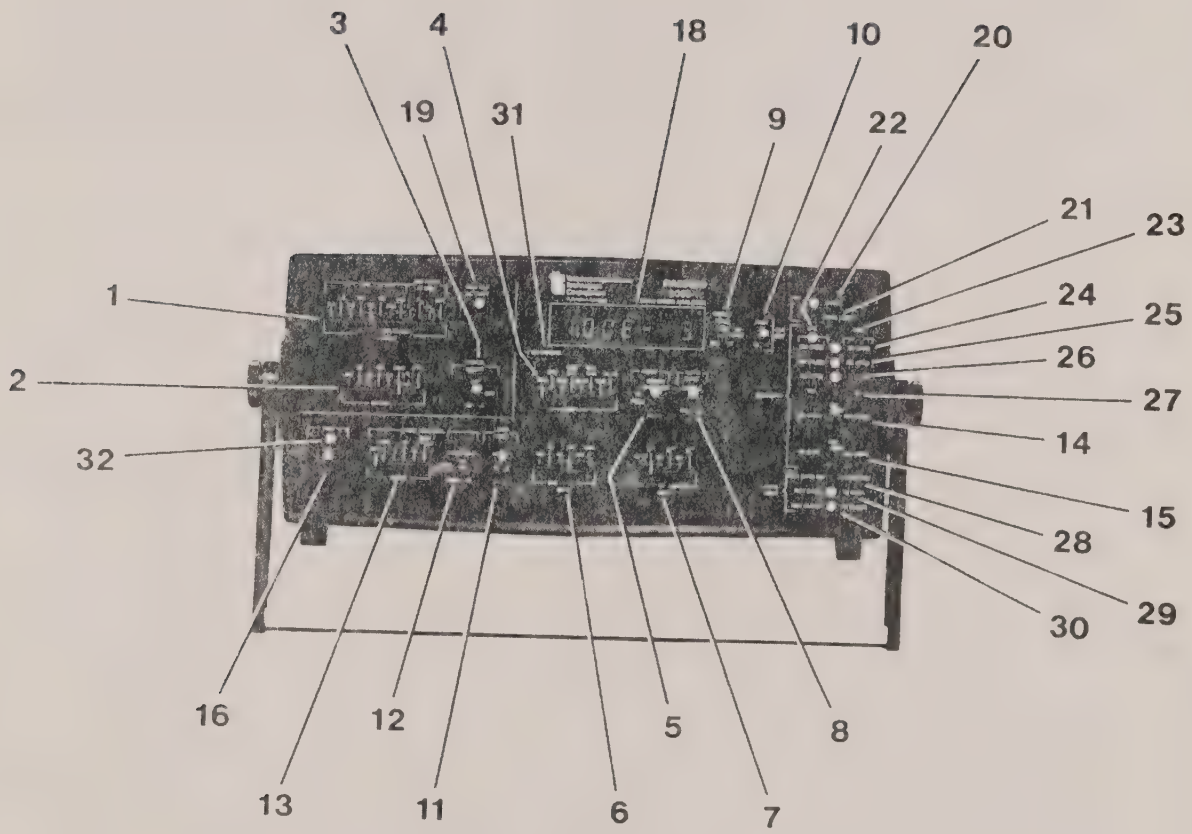

Figure 4-1
FIREBERD 2000-1 FRONT PANEL

ML10202

DWG 40230

5. MODE: ERROR ANALYSIS/TX FREQ/RCV FREQ

This switch selects one of the three operating modes for the test set. The source of clock and data for measurements is dependent on DTE or DCE mode of operation.

In Error Analysis Mode, error analysis functions are performed on the receive clock and data signals for DTE operation or the transmit clock and data for DCE operation.

Transmit Frequency (TX FREQ) Mode measures and displays the clock signal from one of two sources. In the DTE operation, the source for this measurement is the clock signal selected by the GENERATOR CLOCK switch. In DCE operation, the source for this measurement is the clock signal received by the error analysis circuitry.

In Receive Frequency (RCV FREQ) Mode the clock signal for this measurement is taken from one of two sources. In DTE operation the source is the clock signal being received by the error analysis circuitry. For DCE operations the source is the signal selected by the GENERATOR CLOCK switch.

6. BLK LENGTH (bits) : 400/1K/4K/10K/40K/100K

Selects the Block Length in bits used to develop the Block and Block Error results for an Error Analysis test.

7. BER TEST LENGTH (bits) : AUTO/10^6/10^7/10^8/10^9/10^{10}

The right-most 5 positions of this switch indicate the number of bits used to compute the BER result. For example, in 10^7 position, errors are accumulated over a period of 10^7 bits, the number of errors is then divided by 10^7 to get the BER result.

The AUTO position performs a BER test which counts errors for a 10^5 bit interval. After 10^5 bits a BER result will be available to be displayed or printed. The BER test will be restarted at this point if 100 or more errors have been accumulated. If less than 100 errors have been counted the BER test will continue until 10^6 bits have been received at which time the new result will be available

for display or print out. If less than 100 errors are present the measurement will continue until 10^7 bits have been received. In this manner, the BER test will continue until a result with at least 100 error is available or until a 10^{11} bit test is reached. In either case, the result will be output and the test restarted. The last result obtained (a result with more than 100 errors or a result for a 10^{11} bit interval) will be used for display and print out until the next result with more than 100 errors or 10^{11} bits is obtained.

8. AUTO SYNC: ENABLE/DISABLE

When a synchronization is initiated in Error Analysis Mode, the automatic synchronization circuitry will attempt to lock on to the incoming data. Once synchronization has been obtained, the position of the AUTO SYNC switch determines how the test set will respond to very high error rates.

In the ENABLE position, the receiver will automatically resynchronize and restart the test if more than 100 errors occur in a 1000 bit interval (10^{-1} error rate).

In the DISABLE position, the receiver is inhibited from resynchronizing at any rate. This allows the unit to perform measurements on channels with high error rates which would normally cause the unit to resynchronize and restart the test.

The ENABLE position should be used unless error bursts or error rates greater than 10^{-1} are anticipated. The AUTO SYNC switch may be changed from the ENABLE to the DISABLE position during a test without causing a test restart. When this switch is changed from DISABLE to ENABLE the test will not restart unless, the error rate exceeds 10^{-1}.

9. RESULT HOLD/UPDATE/RESTART

Depressing this switch into the RESTART position, in the AUTO SYNC ENABLE Mode will clear all of the FIREBERD result accumulators and restart the test. This will not cause a resynchronization

to the incoming data in the ENABLE Mode. Depressing this switch in the AUTO SYNC DISABLE Mode will clear all of the result accumulators, restart the test, and force a resynchronization to the incoming data.

The UPDATE position allows the Display to change as the ongoing tests dictate. This is the normal operating position for the FIREBERD test set.

The RESULT HOLD position will freeze the result currently being displayed as well as all other results selectable with the DISPLAY switch.

10. CLK SET: FAST/SLOW

Increments the time or date units when setting the real time clock.

To enter Time Set Mode the PRINT CONTROL toggle switch is held in the RESULTS position. After 3 seconds, Time Set mode is activated. Time or Date parameters to be set are selected by the 5 left-most DISPLAY switch positions.

Once in Time Set Mode, the time or date parameters to be set will be flashing on the Display. The new Time and Date presently displayed will be set when the RESULTS switch is released. When setting the seconds, depressing the CLK SET switch to either the FAST or SLOW positions will set the Seconds to zero instead of incrementing the count.

11. LOOP TEST:NORM/LOOP

The Normal (NORM) position is selected for normal Data Error Analyzer operation. The LOOP position activates a relay or data selector on the Interface adapter which loops the transmit clock and data outputs back to the receive clock and data inputs. The relay or data selector also isolates the interface connector so that the interface cable need not be removed for the loop test.

12. PRINT CONTROL:CONTROL/AUTO/RESULTS

This toggle switch allows 3 modes of printer operation. The RESULTS position causes a print out of all available results

4.2.1 Selector Switches

1. GENERATOR CLOCK TX(RCV): 2.4/4.8/9.6/19.2/56/112/224/448/FA/FB/FC/EX

Selects the Generator clock from: one of eight standard internal frequencies (2.4, 4.8, 9.6, 19.2, 56, 112, 224, 448 kHz), one of the optional user selected internal frequencies (FA, FB, or FC), the external input (EXT) on the plug-in interface module, or the rear panel BNC (EXT CLK IN).

The EXT position of this switch will select the signal from the BNC (EXT CLK IN) as the input when a signal with a voltage of .6 volts to 25 vpp is present at the BNC connector, otherwise it will select the external input from the interface module.

2. PATTERN : MK/SP/1:3/63/511/2047/2^{15}-1/2^{20}-1

Selects the generator and receiver test patterns in error analysis mode from: constant mark (MK), constant space (SP), 1:3 or one of five pseudorandom patterns (63, 511, 2047, 2^{15}-1, 2^{20}-1).

3. ERROR INSERT: 10^{-3}/OFF/SINGLE

One error is inserted in the generated data pattern each time this switch is depressed (SINGLE). In the center position (OFF), no errors are inserted. In the upper position, (10^{-3}) a continuous error rate of one error per 1000 bits is inserted into the generated data stream.

4. DISPLAY: BER/ERR/SEC/ERR SEC/BLKS/BLK ERR/TIME/DATE

Selects the result to be displayed. In Error Analysis mode, the results are: Bit Error Rate (BER), Errors (ERR), Seconds (SEC), Errored Seconds (ERR SEC), Blocks (BLKS), Block Errors (BLK ERR), Time and Date. In either frequency mode the appropriate frequency result is displayed in all positions except Time or Date which cause the time or date to be displayed.

(including time, date, and ID number) for either Error Analysis or Frequency.

The AUTO position allows data outputs to be controlled by the EVENT switch.

The CONTROLS position provides a printed record of all test parameters set by the front panel switches. This position will also cause a print out of the Interface Module switch positions for some types of interfaces.

13. PRINT CONTROL /EVENT: OFF/ERR/1/10/30/BER CYCLE

The OFF position disables data output to the printer. Only manually activated print commands will cause a print out. All printer data is buffered before reaching the printer; entering the OFF position clears this buffer.

In Error Analysis Mode, the Error (ERR) position causes a printing to be initiated on the occurance of an errored second and every 60 minutes. The 1, 10 and 30 positions initiate print outs every 1, 10 and 30 minutes respectively. The BER CYCLE position initiate a print at the end of each BER measurement cycle as set by the BER TEST LENGTH switch.

In Frequency Mode data prints are initiated every 1, 10, or 30 minute interval dependent on the position of the EVENT switch.

14. RS(RTS)/RR(RLSD):ON/OFF

Controls the state of the Request to Send signaling leads output when the FIREBERD is used as a DTE with V.35/306, RS-232, RS-449 or WECO 303 type interface modules. For DCE operation this switch controls the Receiver Ready (RR) signaling lead for the RS-449 DTE/DCE interface module and Receive Line Signal Detect (RLSD) for for V.35/306 DTE/DCE or RS-232 DTE/DCE interface modules .

15. TR(DTR)/DM(DSR): ON/OFF

Controls the state of the Data Terminal Ready signaling lead output when FIREBERD is used as a DTE with a V.35/306 DTE/DCE,

RS-232 DTE/DCE or RS-449 DTE/DCE Interface Modules, and the Data Mode signalling lead output when used as a DCE with the RS-449 DTE/DCE Interface Module and Data Set Ready when used with V.35/306 DTE/DCE and RS-232 DTE/DCE interfaces.

16. PWR: ON

Applies power to, or removes power from the entire instrument.

17. AUDIO INDICATOR : HI/OFF/LO

Sets the internal Audio Indicator to high volume, off, or low volume. In Error Analysis mode, the indicator will beep twice at the end of each BER measurement cycle and three times on the occurance of a sync Loss. If the DISPLAY switch is in the ERR SEC position, it will beep on the occurance of an errored second also. The Audio Indicator does not function in Frequency Mode.

4.2.2 Indicators

18. SEVEN DIGIT DISPLAY

Displays Error Analysis and Frequency test results. All decimal points illuminate when the result being displayed has overflowed.

19. GEN CLK ACTIVITY

Indicates that a clock is present at the pattern generator input.

20. SYNC

Indicates that the receiver is synchronized to the incoming data. Must be illuminated for an error analysis test to proceed.

Once synchronization is obtained, loss of synchronization will not be detected in AUTO SYNC DISABLE MODE. This indicator will be off in Frequency Mode.

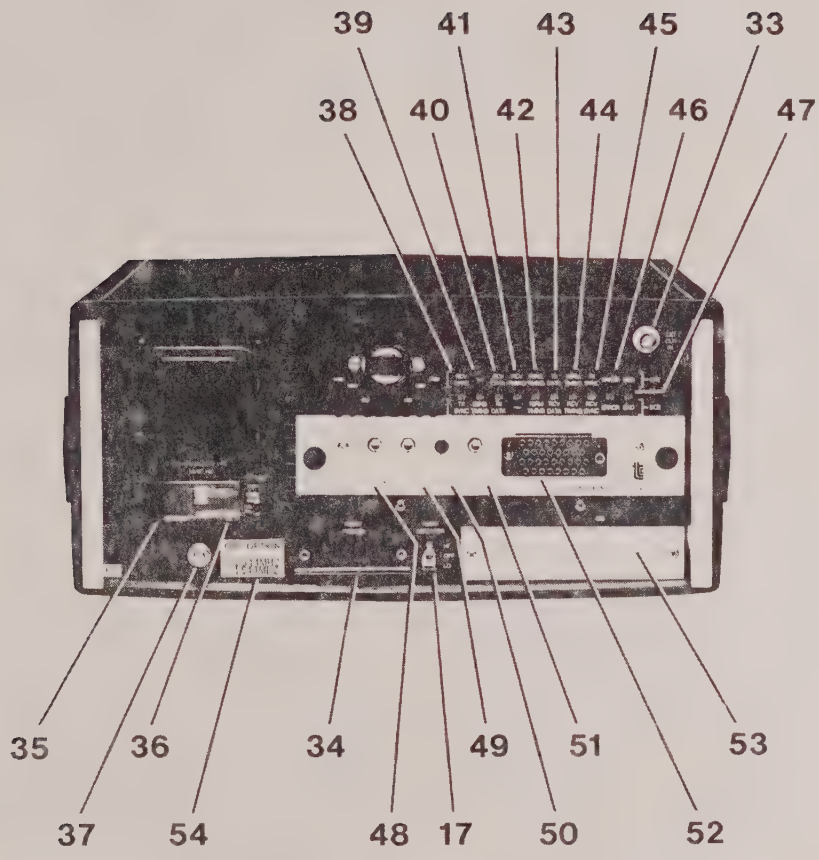

Figure 4-2
FIREBERD 2000-1 REAR PANEL

21. SYNC LOST

This indicator illuminates when synchronization is lost and reset by beginning a new test, via TEST RESTART or changing one of the test parameters which cause a test restart. This indicator will be off in Frequency Mode.

22. DTE

Illuminates when the FIREBERD is acting as Data Terminal Equipment (DTE).

23. DCE

Illuminates when the FIREBERD is acting as Data Communication Equipment (DCE).

24. DM(DSR)/TR(DTR)

Illuminates when the Data Set Ready Signalling lead is in the ON condition during DTE operation for the RS-232, WECO 303, V.35/306 interfaces or when the Data Mode signalling lead is in the ON condition for RS-449 interfaces. In DCE operation, illuminates when Data Terminal Ready or Terminal Ready for the respective interface. Not applicable for DS1, Lab, or MIL-188 Interfaces.

25. RR(RLSD)/RS(RTS)

When the FIREBERD is acting as a DTE this indicator illuminates when the Receive Line Signal Detector is in the ON condition for the RS-232 type or V.35/306 type interfaces or when the Receiver Ready in ON for the RS-449, type interfaces.

When the FIREBERD is acting as a DCE this indicator will illuminate when the Request To Send signalling input is in the ON condition for RS-232 DTE/DCE, RS-449 DTE/DCE and V.35 DTE/DCE interfaces.

26. CS(CTS)/LL

Illuminates when the Clear to Send Signalling lead is in the ON condition during DTE operation for all FIREBERD interfaces except the DS1, LAB and MIL-188. When the FIREBERD is acting as a DCE this indicator illuminates when the Local Loopback input is in the ON condition for RS-449 DCE/DTE or the RS-449 Bridging interface.

27. TM/RL

This indicator illuminates in DTE operation when the Test Mode signalling lead input is at the ON condition for the RS-449 DTE/DCE and Bridging Interfaces. During DCE operation it illuminates when the Remote Loopback is in the ON condition for RS-449 DTE/DCE and Bridging interfaces.

28. RCV DATA INV/TX DATA INV

Illuminates in DTE operation when the received data is inverted with respect to the generator data, or in DCE operation when the data being received by the FIREBERD error analysis circuitry (TX DATA) is inverted with respect to the generator data. This indicator is not applicable when there is no sync or for the Frequency Mode.

29. RCV DATA/TX DATA

Indicates there is receive data activity in DTE operation or transmit data activity in DCE operation.

30. RCV CLOCK/TX CLOCK

Indicates during DTE operation that there is RCV Clock activity at the input to the error analysis circuitry. For DCE operation this indicator illuminates when there is transmit clock (TX CLOCK) activity at the input to the error analysis circuitry.

31. <100 ERRORS

Illuminates when less than 100 errors have been accumulated for the BER result presently available. This indicator is updated each time a new BER result is available. Not valid for Frequency Mode.

32. PWR

Illuminates when FIREBERD has power applied.

4.2.3 Connectors

33. EXT CLK IN

Used to input signals ranging from .6 volts to 25 volts peak to peak for use as the generator clock when the GENERATOR CLOCK switch is in the EXT position. If no signal is present at the EXT CLK IN (BNC) input, the signal selected by the EXT position of the GENERATOR CLOCK TX(RCV) switch is the external clock input from the interface adaptor.

34. RS-232 PRINTER

Used to interface with a RS-232 printer or the DL-2000 Data Logger.

35. AC INPUT

Power input from AC line.

36. VOLTAGE SELECT 100/120/220/240

Used to select AC operating voltage. Voltage setting may be changed by : removing power cord, sliding plastic door to the left, removing fuse and finally removing selector card. Once removed the card may be flipped over and reinserted to select a different operating voltage range. The operating voltage selected is visible through the plastic door once the card is installed.

37. GROUND STUD

Connected to chassis and circuit ground

4.2.4 Test Points

*All test points are driven by standard TTL gates with series 220 ohm resistors.

38. RCV SYNC/TX SYNC

This Test Point provides one pulse for each repetition of the incoming pseudorandom pattern.

39. -/SEND TIMING

For DCE operation this test point develops a signal equivalent to that being transmited at the Send Timing (ST) interface output lead. This is not applicable in DTE operation.

40. RCV DATA/TX DATA

The Receive data test point develops a signal equivalent to the signal at the incoming data input to the error analysis circuitry of the FIREBERD.

41. RCV TIMING/-

For DTE operation the Receive Timing test point is a TTL signal equivalent to the received clock at the input to the interface adaptor. This test point is not applicable for DCE mode.

42. SEND TIMING/TERM TIMING

Outputs a TTL signal equivalent to the clock signal at the Interface connector.

43. TX DATA/RCV DATA

This test point provides a TTL equivalent to the data signal output from the Interface Adaptor.

44. TERM TIMING/RCV TIMING

This test point provides a TTL equivalent to the clock signal developed by the generator clock at the transmit clock output of the Interface adapter.

45. TX SYNC/RCV SYNC

This test point provides one pulse for each repetition of the selected pseudorandom pattern generated by the FIREBERD.

46. ERROR

For DTE or DCE operation this test point provides one pulse for each error detected by the FIREBERD error analysis circuitry.

47. GND

Provides a circuit and chassis ground.

4.2.5 Interface Module Components (V.35-306 DTE/DCE Interface Shown)

48. TX CLK/RCV CLK:NORMAL/INVERT

In the NORMAL position the clock-data phase relationship at the Interface adapter will be as specified for normal V.35/306 operation. The INVERT position causes the clock-data phase relationship to be inverted to that specified for normal operation.

49. RCV CLK/TX CLK:NORMAL/INVERT

In the NORMAL position the FIREBERD error analysis circuitry expects to see the clock-data phase relationship as specified for normal V.35/306 operation. In the INVERT position the FIREBERD expects to see the phase relationship inverted to that specified for normal operation.

50. NON-STANDARD TIMING

Illuminates when either the TRANSMIT CLOCK OR RECEIVE CLOCK switch is placed in the INVERT position.

51. TIMING MODE:V.35/306

In V.35 mode the Interface module utilizes the Serial Clock Transmit (SCT) input as specified to generate the transmit Data (SD).

The 306 mode, uses the SCT or an internal clock signal to generate both Serial Clock Transmit External (SCTE) and Send Data (SD).

52. V.35/306 DATA INTERFACE CONNECTOR

4.2.5.1 Additional Information

53. Cover plate for the IEEE-488 Interface option, connector and dip switch.

54. OSC OPTION

Labels frequency of optional oscillators which are installed in GENERATOR CLOCK positions FA, FB, FC.